

## **REMARKS/ARGUMENTS**

Claims 1, 3-12 and 14-17 are pending in the present application. Claims 1, 6, 7, 9, 12 and 17 were amended and claims 2 and 13 were canceled. No claims have been added. Applicants have carefully considered the cited art and the Examiner's comments, and believe the claims patentably distinguish over the cited art in their present form. Reconsideration of the rejection is, accordingly, respectfully requested in view of the above amendments and the following comments.

### **I. Information Disclosure Statement**

The Examiner advises that the Information Disclosure Statement filed January 14, 2004, has not been considered because the listing of related applications does not include the application number and, in some cases, the filing date.

In response, a replacement Information Disclosure Statement is submitted herewith providing the missing information. The Examiner is respectfully requested to fully consider the information referred to therein and to acknowledge having done so in the next Office communication.

Applicants believe there should be no fee required for this replacement Information Disclosure Statement inasmuch as it simply updates information regarding the documents disclosed in the previously filed Information Disclosure Statement. If the Examiner disagrees, however, the Examiner is authorized to charge the required fee to IBM Deposit Account No. 09-0447.

### **II. Specification**

The Examiner has objected to the specification because of incomplete information regarding the related applications listed on pages 1 and 2 of the specification.

The missing information has been furnished by the present Amendment, and the objection to the specification has been overcome.

### **III. Double Patenting**

The Examiner provisionally rejects claims 1, 2, 7, 12 and 13 on the grounds of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 2, 4, 7, 8, 11, 14-16, 18 and 21 of copending Application No. 10/757,237 in view of "Accurate and Practical Profile-Driven Compilation Using the Profile Buffer" by Conte et al. (hereinafter "Conte").

In order to expedite prosecution, a Terminal disclaimer is enclosed herewith.

Therefore, the provisional Double Patenting rejection has been overcome.

#### IV. 35 U.S.C. § 101

The Examiner has rejected claims 12-17 under 35 U.S.C. § 101 as being directed towards non-statutory subject matter. This rejection is respectfully traversed.

In rejecting the claims, the Examiner states:

Claim 12 is directed to a "computer program product in a computer readable medium." However, page 25 of the specification describes such computer readable medium as including "wireless communications." Claims that recite nothing but the physical characteristics of a form of energy, such as a frequency, voltage, or the strength of a magnetic field, define energy or magnetism, per se, and as such are nonstatutory natural phenomena. O'Reilly, 56 U.S. (15 How.) at 112-14. Moreover, it does not appear that a claim reciting a signal encoded with functional descriptive material falls within any of the categories of patentable subject matter set forth in Sec. § 101. First, a claimed signal is clearly not a "process" under § 101 because it is not a series of steps. A claimed signal has no physical structure, does not itself perform any useful, concrete and tangible result and, thus, does not fit within the definition of a machine. A claimed signal is not matter, but a form of energy, and therefore is not a composition of matter. A product is a tangible physical article or object, some form of matter, which a signal is not. In contrast, a tangibly claimed computer-readable medium (e.g. magnetic or optical disk) encoded with a data structure defines structural and functional interrelationships between the data structure and the computer software and hardware components which permit the data structure's functionality to be realized, and is thus statutory.

Office Action dated January 16, 2007, pages 5-6.

The Examiner asserts that claims 12 and 14-17 are not limited to tangible embodiments. However, no basis is present for holding a computer usable medium claim non-statutory because the medium may be allegedly "intangible." The MPEP states:

In this context, "functional descriptive material" consists of **data structures** and computer programs **which impart functionality when employed as a computer component**. (The definition of "data structure" is "a physical or logical relationship among data elements, designed to support specific data manipulation functions." The New IEEE Standard Dictionary of Electrical and Electronics Terms 308 (5th ed. 1993).) "Nonfunctional descriptive material" includes but is not limited to music, literary works and a compilation or mere arrangement of data.

**When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized.** Compare *In re Lowry*, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (claim to data structure stored on a computer readable medium that increases computer efficiency held statutory) and *Warmerdam*, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having a

specific data structure stored in memory held statutory product-by-process claim) with *Warmerdam*, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure *per se* held nonstatutory). (**emphasis added**)

MPEP 2106 (IV)(B)(1).

Claims 12 and 14-17 recite clearly functional descriptive material since they impart functionality when employed as a computer component. Moreover, the functional descriptive material of claims 12 and 14-17 is recorded on "some" computer-readable medium.

In the above context, the term "some" means "any" computer-readable medium. The MPEP does not draw any distinctions between one type of media that is considered to be statutory and another type of media that is considered to be non-statutory. To the contrary, the MPEP clearly states that as long as the functional descriptive material is in "some" computer-readable medium, it should be considered statutory. The only exceptions to this statement in the MPEP are functional descriptive material that does not generate a useful, concrete and tangible result, e.g., functional descriptive material composed completely of pure mathematical concepts that provide no practical result. Claims 12 and 14-17 clearly recite a useful, concrete and tangible result in that a block of code is locally reorganized such that fewer branches are taken. This is not just some disembodied mathematical concept or abstract idea.

Thus, claims 12 and 14-17 are directed to functional descriptive material that provides a useful, concrete and tangible result, and which is embodied on "some" computer-readable medium. Therefore, claims 12 and 14-17 are statutory and the rejection of the claims under 35 U.S.C. § 101 has been overcome.

V. **35 U.S.C. § 112, Second Paragraph**

The Examiner has rejected claims 6 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter, which applicants regard as the invention.

The Examiner states:

Claim 6 recites: "switching a then/else statement..." However, this phrase does not appear to be complete. Switching a then/else statement with what? The word "switching typically involves switching one thing *with* another. In the case of claim 6, there is only a then/else statement, and no other thing with which to switch. For the purpose of further examination, this limitation will be interpreted in light of page 21 of specification to mean -- swapping the location of then and else statements--.

Office Action dated January 16, 2007, pages 6-7.

Claim 6 has been amended herein to more clearly recite that a location of a then statement and a location of an else statement are switched. Corresponding claims 9 and 17 have been amended in a similar manner. The claims are now believed to be clear and definite in all respects and the rejection under 35 U.S.C. § 112, second paragraph, has been overcome.

**VI. 35 U.S.C. § 102, Anticipation**

The Examiner has rejected claims 1-4, 7, 10, and 11 under 35 U.S.C. § 102(b) as being anticipated by "Accurate and Practical Profile-Driven Compilation Using the Profile Buffer" by Conte et al. (hereinafter "Conte"). This rejection is respectfully traversed.

In rejecting the claims, the Examiner states:

In regard to claim 1, Conte discloses:

*A method of autonomically reorganizing code of a computer program (see Abstract), comprising the steps of:*

*monitoring branch count per instruction statistics, wherein the branch count per instruction statistics are generated from the results of a set of hardware counters that count branches taken per instruction of the computer program; See page 37, section 2.1, e.g. "profile buffer." Also see Figure 1 on page 38. This buffer is used to count the number of times a branch is taken.*

*determining whether a block of code is to be reorganized, wherein the block of code comprises a set of instructions; in response to the step of determining, locally reorganizing the block of code such that fewer branches are taken. See page 36, bottom of column 1, e.g. "superblock scheduling." Conte generally describes the use of hardware counters to collect profile information used in various optimizations including "superblock scheduling," which rearranges basic blocks in the order that they tend to occur.*

In regard to claim 2, the above rejection of claim 1 is incorporated. Conte further discloses: *wherein the step of determining whether a block of code is to be reorganized is based on the branch count per instruction statistics. See bottom of page 36, column 1, e.g. "profile-driven superblock formation."*

Office Action dated January 16, 2007, pages 7-8.

Claim 1 as amended herein is as follows:

1. A method of autonomically reorganizing code of a computer program, comprising the steps of:
  - monitoring branch count per instruction statistics, wherein the branch count per instruction statistics are generated from the results of a set of hardware counters that count branches taken per instruction of the computer program;
  - determining whether a block of code is to be reorganized based on a number of times a branch is taken per instruction, wherein the block of code comprises a set of instructions; and
  - in response to determining that a block of code is to be reorganized, locally reorganizing the block of code such that fewer branches are taken.

A prior art reference anticipates a claimed invention under 35 U.S.C. § 102 only if every element of the claimed invention is identically shown in that single prior art reference, arranged as they are in the claims. *In re Bond*, 910 F.2d 831, 832, 15 U.S.P.Q.2d 1566, 1567 (Fed. Cir. 1990). All limitations of a claimed invention must be considered when determining patentability. *In re Lowry*, 32 F.3d 1579, 1582, 32 U.S.P.Q.2d 1031, 1034 (Fed. Cir. 1994). Anticipation focuses on whether a claim reads on the product or process a prior art reference discloses, not on what the reference broadly teaches. *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 U.S.P.Q. 781 (Fed. Cir. 1983).

Applicants respectfully submit that Conte does not identically show every element of the claimed invention arranged as they are in the claims; and, accordingly, does not anticipate the claims. With respect to claim 1, in particular, Conte does not teach or suggest “determining whether a block of code is to be reorganized based on a number of times a branch is taken per instruction, wherein the block of code comprises a set of instructions”, and also does not teach or suggest “in response to determining that a block of code is to be reorganized, locally reorganizing the block of code such that fewer branches are taken.”

Conte is directed to the use of hardware dedicated to the task of profiling (see Abstract). Conte discloses providing a specialized buffer, referred to as a “profile buffer”, which comprises a set of counters, with each entry in the buffer consisting of two fields: the number of times a branch is taken and a number of times a branch is not taken or falls-through. Conte discloses “At write-back, when the branch retires, the profile buffer is referenced using the branch address or calculated index and one of the two fields of the corresponding *profile buffer* entry are updated based on whether the branch was taken” (sentence bridging pages 37 and 38).

Conte does not disclose or suggest a step of “determining whether a block of code is to be reorganized based on a number of times a branch is taken per instruction, wherein the block of code comprises a set of instructions” or a step of “in response to determining that a block of code is to be reorganized, locally reorganizing the block of code such that fewer branches are taken” as are recited in claim 1. The Examiner refers to the bottom of column 1 on page 36 of Conte as disclosing the determining and in response to determining steps. Conte, however, only summarizes areas in which profiling information is important, such areas including branch prediction and superblock scheduling. Conte does not, however, disclose or in any way suggest that a determination is made whether a

block of code is to be reorganized based on a number of times a branch is taken per instruction, or that in response to determining that a block of code is to be reorganized, locally reorganizing the block of code such that fewer branches are taken. Such disclosures are contained only in the present application.

Claim 1, accordingly, is not anticipated by Conte and patentably distinguishes over Conte in its present form.

Claims 3 and 4 depend from and further restrict claim 1, and are also not anticipated by Conte, at least by virtue of their dependency.

Independent claim 7 has been amended in a similar manner as claim 1 and is also not anticipated by Conte for similar reasons as discussed above with respect to claim 1. Claims 10 and 11 depend from claim 7 and are not anticipated by Conte at least by virtue of their dependency.

Therefore, the rejection of claims 1-4, 7, 10, and 11 under 35 U.S.C. § 102(b) has been overcome.

#### **VII. 35 U.S.C. § 103, Obviousness (claims 5, 6, 8, 9, 16, and 17)**

The Examiner has rejected claims 5, 6, 8, 9, 16, and 17 under 35 U.S.C. § 103(a) as being unpatentable over Conte in view of “Compilers: Principles, Techniques, and Tools” by Aho et al. (hereinafter “Aho”), in view of U.S. Patent No. 6,006,033 to Heisch (hereinafter “Heisch”). This rejection is respectfully traversed.

The Examiner states:

In regard to claim 5, the above rejection of claim 1 is incorporated. Conte does not expressly disclose: *wherein reorganizing the block of code is performed locally by modifying an if/then/else clause condition*. However, Aho teaches conditional if/then/else clauses. See Fig. 8.23. Aho does not expressly disclose modification of conditional clauses. However, Heisch teaches modification of a conditional clause. See column 6 lines 20-44. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use Aho's conditional clauses and Heisch's modification with Conte's reorganization in order to operate more efficiently (see Heisch column 6 lines 37-41)

In regard to claim 6, the above rejection of claim 1 is incorporated. Conte does not expressly disclose: *wherein reorganization of the block of code is performed locally by [swapping the location of then and else statements] of an if/then/else clause of a branch instruction of the block of code*. However, Aho teaches conditional if/then/else clauses. See Fig. 8.23. Aho does not expressly disclose swapping clauses. However, Heisch teaches modification of a conditional clause. See column 6 lines 30-37. Heisch's modification essentially teaches swapping out

of the "then" clause. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use Aho's else clause and Heisch's modification with Conte's reorganization in order to operate more efficiently (see Heisch column 6 lines 37-41.

Office Action dated January 16, 2007, pages 9-10.

Initially, neither Aho nor Heisch supplies the deficiencies in Conte as discussed above with respect to claim 1. Therefore, claims 5, 6, 8, 9, 16 and 17 patentably distinguish over the references by virtue of their dependency.

In addition, Aho simply discloses that if/then/else statements are known, and Heisch is cited only as disclosing that it is known to modify a conditional clause. Neither Conte nor Aho nor Heisch provides any disclosure that would suggest "reorganizing the block of code is performed locally by modifying an if/then/else clause condition", as recited in claim 5, or that "reorganization of the block of code is performed locally by switching a location of a then statement of an if/then/else clause with a location of an else statement of the if/then/else clause of a branch instruction of the block of code" as now recited in claim 6. Applicants respectfully submit that the only suggestion for combining the references as proposed by the Examiner is contained in Applicants' own disclosure, and that the Examiner is using hindsight based on Applicants' disclosure in rejecting the claims. The Examiner has not, accordingly, established a *prima facie* case of obviousness in rejecting the claims

Therefore, claims 5, 6, 8, 9, 16, and 17 are not obvious in view of the references, and the rejection of claims 5, 6, 8, 9, 16, and 17 under 35 U.S.C. § 103(a) has been overcome.

#### **VIII. 35 U.S.C. § 103, Obviousness (claims 12-15)**

The Examiner has rejected Claims 12-15 under 35 U.S.C. 103(a) as being unpatentable over Conte in view of Heisch. This rejection is respectfully traversed.

The Examiner states:

In regard to claim 12, Conte does not expressly disclose: *A computer program product in a computer readable medium.* However, Heisch teaches this in FIG. 1 and column 14 lines 40-65. All further limitations have been addressed in the above rejection of claim 1. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use Heisch's product with Conte's reorganizing in order to distribute the software.

Office Action dated January 16, 2007, page 11.

Heisch does not supply the deficiencies in Conte as discussed in detail above. Independent claim 12 and claim 14 and 15 dependent thereon, accordingly, patentably distinguish over the cited art and are allowable thereover in their present form, at least for the reasons discussed above with respect to claim 1.

Therefore, the rejection of claims 12-15 under 35 U.S.C. § 103(a) has been overcome.

**IX. Conclusion**

For at least all the above reasons, claims 1, 3-12 and 14-17 patentably distinguish over the cited art of record, and this application is believed to be in condition for allowance. It is, accordingly, respectfully requested that the Examiner so find and issue a Notice of Allowance in due course.

The Examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the Examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

DATE: April 16, 2007

Respectfully submitted,

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